Benzo(g,h,i)perylene

Chemical Information
CAS Number - 191-24-2
Alternate Names - 1,12-benzoperylene
General Uses - Benzo(g,h,i)perylene is a polycyclic aromatic hydrocarbon (PAH) that occurs naturally in crude oils. It has no known commercial use or production. Emissions typically result from petroleum refining, coal tar distillation, and the incomplete combustion of organic matter.
Potential Hazards - Unknown at this time. Although some PAHs have caused tumors in laboratory animals, benzo(g,h,i) perylene has not been shown to have a cancer concern. This chemical was added to the TRI based on its ecotoxicity.

Summary Analysis– Benzo(g,h,i)perylene

- Benzo(g,h,i)perylene has been reported to TRI since 2000. In 2003, benzo(g,h,i)perylene accounted for about 0.4 percent of the total quantity of PCs, with a total of 315,282 pounds. Since 2000, there has been about an 85 percent decrease in the PC quantity of benzo(g,h,i)perylene.
- Since 2000, energy recovery has been the primary management method used for benzo(g,h,i)perylene.
- Eight of the 364 facilities that reported benzo(g,h,i)perylene in 2003 accounted for 78 percent of the total quantity.
- Facilities in EPA Regions 3, 4, and 6 accounted for over 86 percent of the benzo(g,h,i)perylene reported in 2003. Over 80 percent of the benzo(g,h,i)perylene was reported by facilities in 5 states (Tennessee, Pennsylvania, Louisiana, Texas, and West Virginia).
- Facilities in 6 industry sectors (SIC codes) accounted for over 90 percent of benzo(g,h,i)perylene reported in 2003. Facilities in SIC 3624 (Carbon and graphite products) reported about 52 percent of the total PC quantity of benzo(g,h,i)perylene.

National Trends - Benzo(g,h,i)perylene. Exhibit 4.32 presents the total PC quantity (pounds) of benzo(g,h,i)perylene in 2000 to 2003 1, showing the disposal, treatment, energy recovery, as well as recycling quantities. Please note that data for 1999 is not included for benzo(g,h,i)perylene because this chemical only was reported to TRI beginning in 2000. In 2003, benzo(g,h,i)perylene accounted for about 0.4 percent of the total quantity of PCs. There has been approximately an 85 percent decrease in the quantity of benzo(g,h,i)perylene reported from 2000 to 2003, although the quantity has been somewhat constant the last two years – a little over 300,000 pounds. Since 2000, Energy recovery has been the primary management method

[1] Some facilities may have mistakenly reported on their TRI Form R the threshold quantity of Benzo(g,h,i)perylene, contained in fuel oil, as a quantity released or as a quantity treated onsite. As such, over-reporting of quantities released to the environment or treated, for these chemicals, may mean that the PC quantity is likewise over-stated. It is important to note that TRI chemicals in fuels that are destroyed during the combustion process are not considered treated. TRI chemicals are only considered treated if they are part of a waste stream and are then managed as a waste. EPA has notified reporters of these potential problems. As facilities submit corrected TRI Form Rs to correct any such over-reporting of this chemical, the PC quantities may decrease in subsequent updates of this Trends Report.

used for benzo(g,h,i)perylene. In 2003, disposal and treatment were used equally to manage benzo(g,h,i)perylene. Recycling of benzo(g,h,i)perylene decreased significantly in 2003.

Exhibit 4.32. National-Level Information for Benzo(g,h,i)perylene

	2000	2001	2002	2003	Percent Change (2000-2003)	Management Method -- Percent of Quantity of this Chemical in 2003
Number of Facilities	325	352	332	364	12.0%	
Disposal Quantity (lbs.)	121,575	85,381	42,899	72,632	-40.3%	23.0%
Energy Recovery Quantity (lbs.)	1,841,025	797,556	208,853	170,078	-90.8%	53.9%
Treatment Quantity (lbs.)	141,798	105,739	56,611	72,572	-48.8%	23.0%
Priority Chemical Quantity (lbs.)	2,104,398	988,675	308,362	315,282	-85.0%	
Recycling Quantity (lbs.)	84,835	172,995	133,345	61,793	-27.2%	

Exhibit 4.33 shows the number of facilities that reported benzo(g,h,i)perylene within various quantity ranges. Of the 364 facilities that reported benzo(g,h,i)perylene in 2003, one facility accounted for almost 43 percent of the total quantity of this chemical. Eight of the facilities accounted for 78 percent of the total PC quantity of benzo(g,h,i)perylene in 2003.

Exhibit 4.33. Distribution of Facilities that Reported Quantities (lbs) for Benzo(g,h,i)perylene in 2003

Benzo(g,h,i)perylene (315,282 pounds)		
Quantity Reported	**Number of Facilities Reporting this quantity (2003)**	**Percent of Total Quantity for this Priority Chemical**
up to 10 pounds	219	0.1%
between 11 - 100 pounds	90	1.2%
between 101 -1,000 pounds	30	3.0%
between 1,001 - 10,000 pounds	17	17.8%
between 10,001 - 100,000 pounds	7	35.1%
between 100,001 - 1 million pounds	1	42.8%
> 1 million pounds	0	0.0%

EPA Region Trends- Benzo(g,h,i)perylene. Exhibit 4.34 shows the PC quantity (pounds) of benzo(g,h,i)perylene reported by facilities in each EPA Region in 2000-2003. In 2003, over 86 percent of the benzo(g,h,i)perylene was reported by facilities in Regions 3, 4, and 6. There has been a considerable decrease – about 1.7 million pounds -- in the quantity of benzo(g,h,i)perylene reported by facilities in Region 4 since 2000. Also, significant decreases have occurred in Region 2 (-47.9%) and in Region 10 (-98.2%). Exhibit 4.35 displays the regional benzo(g,h,i)perylene quantity distribution and distribution of facilities reporting quantities in 2003.

Exhibit 4.34. Quantity of Benzo(g,h,i)perylene, Reported by EPA Regions (2000-2003)

EPA REGION	2000	2001	2002	2003	Percent Change in Quantity (2000-2003)	Percent Of the Total Priority Chemical quantity (2003)
1	1,391	1,003	845	1,220	-12.3%	0.4%
2	16,637	9,166	8,405	8,666	-47.9%	2.7%
3	54,521	46,336	22,704	56,117	2.9%	17.8%
4	1,866,109	812,551	73,984	162,375	-91.3%	51.5%
5	32,055	38,015	44,999	25,372	-20.9%	8.0%
6	47,465	58,142	111,258	53,603	12.9%	17.0%
7	1,565	1,570	1,241	53,603	-23.8%	0.4%
8	4,641	4,560	41,405	5,091	9.7%	1.6%
9	103	83	214	242	135.6%	0.1%
10	79,911	17,251	3,307	1,404	-98.2%	0.4%
Total	2,104,398	988,675	308,362	315,282	-85.0%	100.0%

Exhibit 4.35. Distribution of Facilities Reporting benzo(g,h,i)perylene in 2003 & Quantity of benzo(g,h,i)perylene Reported in 2003 per Region

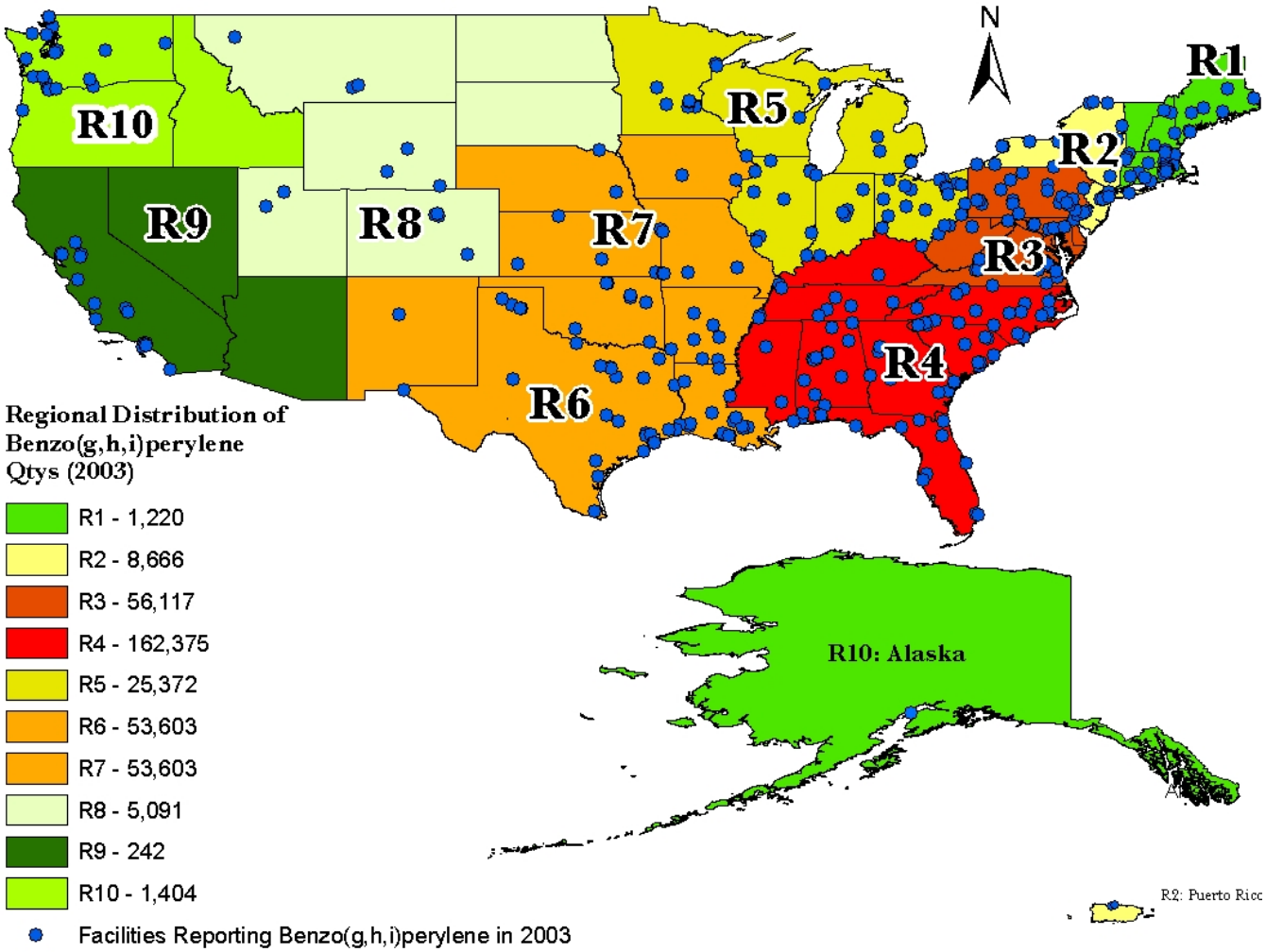


Exhibit 4.36 shows how Benzo(g,h,i)perylene was managed by facilities within each EPA Region in 2003. Most of the PC quantity of Benzo(g,h,i)perylene was managed using onsite energy recovery, particularly by facilities in Region 4. Energy recovery also was the primary method for managing Benzo(g,h,i)perylene in Regions 1,4, 6, and 8. Facilities in Region 2 primarily used treatment, while facilities in Regions 3, 7, 9, and 10 sent most of their Benzo(g,h,i)perylene to land disposal. Region 5 facilities equally used treatment and disposal. Most of the recycling of Benzo(g,h,i)perylene was done by facilities in Region 6.

Exhibit 4.36. Management Methods for Benzo(g,h,i)perylene, By EPA Region (2003)

	Disposal		Energy Recovery		Treatment		Recycling	
EPA Region	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
1	29	142	646	5	374	24	0	1
2	0	795	411	17	7,262	181	370	7
3	0	48,474	4,071	66	3,251	255	8,013	191
4	5,174	519	116,777	174	39,356	374	362	3,253
5	6	12,198	263	1,153	11,565	187	9,367	13
6	131	2,926	40,026	1,355	8,808	356	18,698	20,736
7	267	534	22	42	240	87	20	11
8	5	31	4,978	24	2	51	3	0
9	15	196	0	21	0	10	0	2
10	20	1,169	26	0	183	6	744	0

State Trends- Benzo(g,h,i)perylene. Although facilities in 43 states reported a PC quantity of benzo(g,h,i)perylene in 2003, facilities in 8 of these states reported over 90 percent of the total quantity (Exhibit 4.37). Tennessee facilities, with over 48 percent of the total quantity of benzo(g,h,i)perylene, had an decrease of almost 92 percent since 2000 (Exhibit 4.38). Facilities in several other states, including West Virginia (Exhibit 4.38), Ohio, and New York, also had decreased quantities in 2003. In Pennsylvania, the 2003 quantity of benzo(g,h,i)perylene more than tripled. Michigan facilities reported only a very small quantity of benzo(g,h,i)perylene from 2000-2002, but saw a dramatic increase to almost 10,000 pounds in 2003.

Exhibit 4.37. State-Level Information for Benzo(g,h,i)perylene (2000-2003)

State	2000	2001	2002	2003	Change in Quantity (2000-2003)	Percent of Total Quantity of this Priority Chemical (2003)	Percent Change in Quantity (2000-2003)
Tennessee	1,855,845	801,205	66,123	152,338	-1,703,507	48.3%	-91.8%
Pennsylvania	8,543	5,973	4,843	38,502	29,959	12.2%	350.7%
Louisiana	21,479	28,668	29,794	25,160	3,680	8.0%	17.1%
Texas	23,444	24,847	24,820	23,732	289	7.5%	1.2%
West Virginia	42,586	38,266	15,285	14,691	-27,895	4.7%	-65.5%
Ohio	26,536	35,729	38,231	11,961	-14,575	3.8%	-54.9%

State	2000	2001	2002	2003	Change in Quantity (2000-2003)	Percent of Total Quantity of this Priority Chemical (2003)	Percent Change in Quantity (2000-2003)
Michigan	3	4	4	9,921	9,918	3.1%	341988.6%
New York	16,274	8,766	8,023	8,219	-8,055	2.6%	-49.5%
Total	2,104,399	988,676	308,363	315,282	-1,789,116	100.0%	-85.0%

Exhibit 4.38. Benzo(g,h,i)perylene Significant Quantity Trends (1999-2003): Facilities in Tennessee and West Virginia

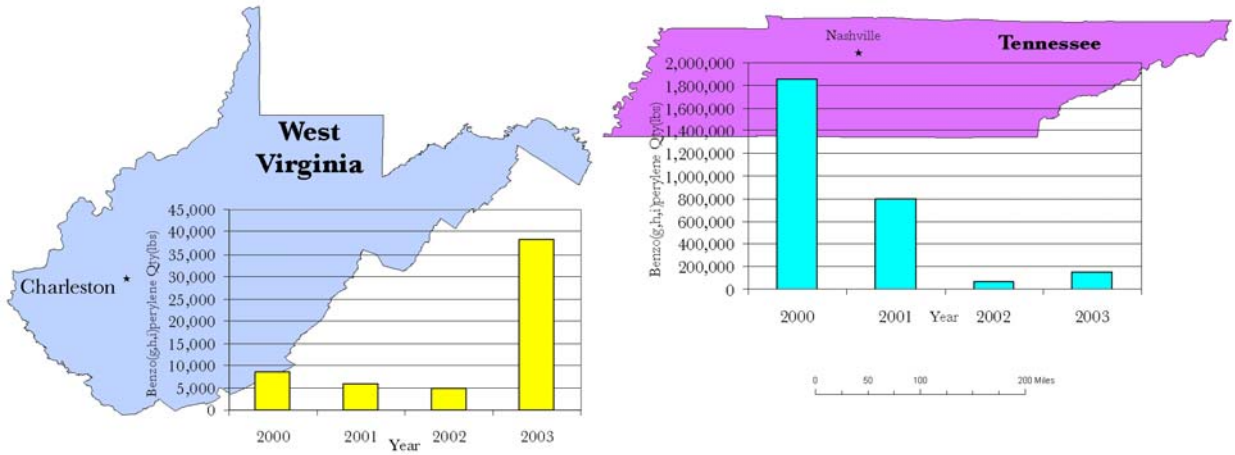
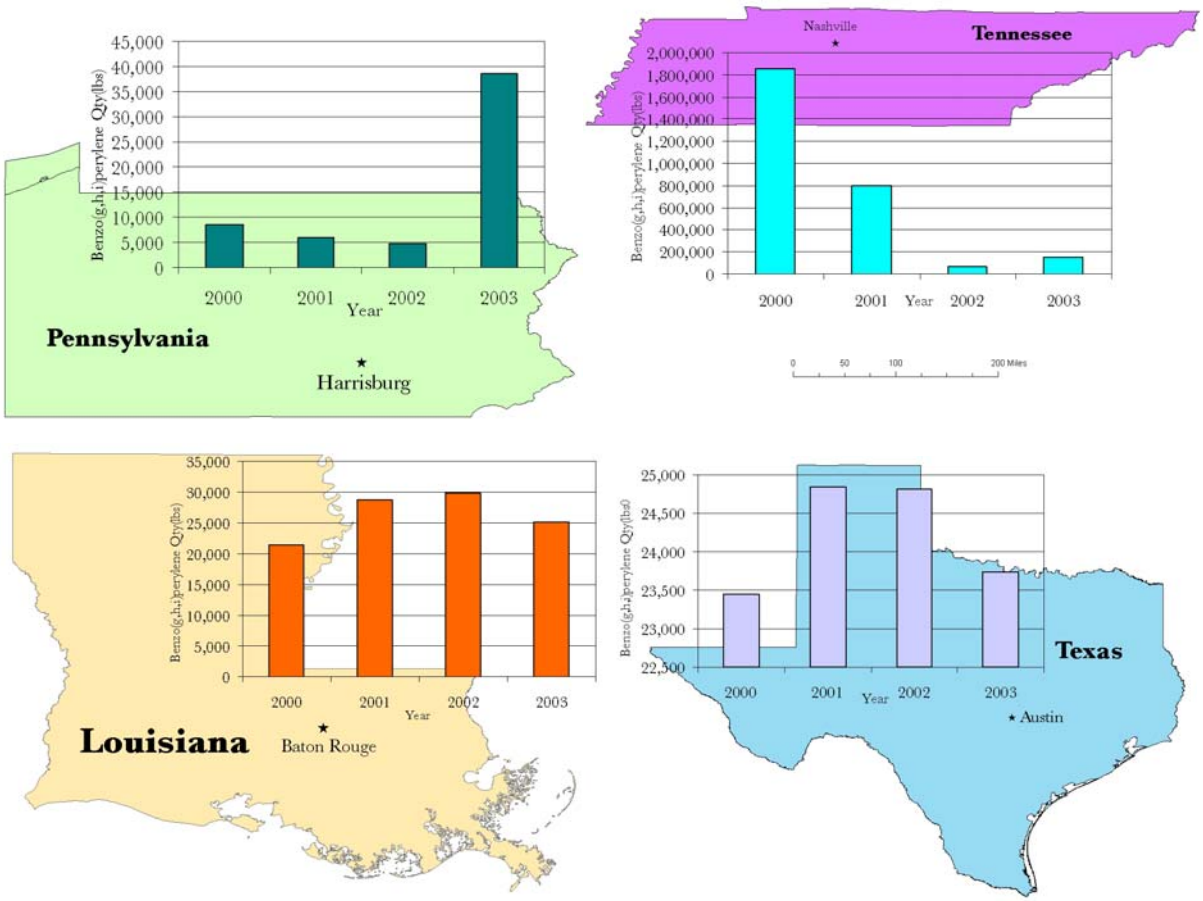


Exhibit 4.39 shows how benzo(g,h,i)perylene was managed by facilities in the 8 states that accounted for over 90 percent of the total quantity of this PC in 2003. Overall, most of the benzo(g,h,i)perylene was managed using onsite energy recovery, especially at facilities in Tennessee, Texas, and Louisiana. Offsite disposal was used primarily by facilities in Pennsylvania, West Virginia, and Michigan. In Ohio and New York facilities, the benzo(g,h,i)perylene was mostly treated onsite. Recycling of notable quantities occurred in Louisiana, Texas, and Pennsylvania. Exhibit 4.40 displays the 4 states that reported the largest quantities of benzo(g,h,i)perylene in 2003.

Exhibit 4.39. Management of Benzo(g,h,i)perylene in States with 90 Percent of Total Quantity (2003)

State	Total Priority Chemical Quantity (2003)	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
Tennessee	152,338	4,653	29	111,627	67	35,923	39	47	2,861
Pennsylvania	38,502	0	34,355	4,069	24	30	24	7,593	8
Louisiana	25,160	26	2,601	15,510	4	6,981	38	0	20,562
Texas	23,732	22	307	21,433	80	1,804	85	18,698	155
West Virginia	14,691	0	14,035	1	7	427	221	0	0
Ohio	11,961	2	772	5	0	11,176	6	0	8
Michigan	9,921	3	9,917	0	0	0	0	0	0
New York	8,219	0	783	44	0	7,217	175	370	4
Total	284,524	4,706	62,800	152,690	182	63,558	588	26,708	23,598

Exhibit 4.40. Trends Analyses of States Reporting Largest 4 Quantities (2003)



Industry Sector (SIC) Trends- Benzo(g,h,i)perylene. Exhibit 4.41 shows the PC quantity (pounds) of benzo(g,h,i)perylene for the six industry sectors (SIC codes) where facilities reported over 90 percent of this chemical in 2003. Facilities in SIC 3624 (Carbon and graphite products) reported the highest quantities, accounting for over 52 percent of the total PC quantity of benzo(g,h,i)perylene reported in 2003. Most of this quantity was reported by one facility, located in Tennessee, with almost 82 percent of the benzo(g,h,i)perylene for this industry sector. This same facility has decreased their quantity of Benzo(g,h,i)perylene by over 90 percent since 2000.

Facilities in 2 of the top 6 industry sectors: SIC 2865 -- Cyclic crudes and intermediates and SIC 3334 – Primary Aluminum reported a significant decrease (-49.6% and -87.2%, respectively) in the quantity of benzo(g,h,i)perylene, compared to the quantities reported in 2000.

Exhibit 4.41. Industry Sector-Level Information for Benzo(g,h,i)perylene (2000-2003)

Primary SIC Code	SIC Description	Number of Facilities for this SIC Code (2003)	2000	2001	2002	2003	Change in Quantity (1999-2003)	Percent of Total Quantity of this Priority Chemical (2003)
3624	Carbon and graphite products	10	1,881,345	824,537	77,738	165,116	-1,716,229	52.4%
2895	Carbon black	19	40,665	37,294	42,333	43,745	3,080	13.9%
3312	Blast furnaces and steel mills	3	506	444	118	33,711	33,205	10.7%
2865	Cyclic crudes and intermediates	7	51,129	50,888	47,031	25,785	-25,344	8.2%
2911	Petroleum refining	46	11,152	14,012	101,897	13,102	1,950	4.2%
3334	Primary aluminum	11	100,484	28,139	17,745	12,900	-87,583	4.1%

Exhibit 4.42 shows how benzo(g,h,i)perylene was managed by facilities in the six industry sectors that accounted for over 90 percent of the total quantity of this PC in 2003. Over 50 percent of the benzo(g,h,i)perylene was sent to onsite energy recovery, primarily within SIC 3624 – Carbon and graphite products, SIC 2895 – Carbon Black, and SIC 2911 – Petroleum Refining. Most of the benzo(g,h,i)perylene in SIC 3312-Blast Furnaces and steel mills and SIC 2865 – Cyclic crudes and intermediates was sent to offsite disposal. Facilities in SIC 3334 – Primary Aluminum primarily used onsite treatment and also recycled a significant quantity of benzo(g,h,i)perylene.

Exhibit 4.42. Management of Benzo(g,h,i)perylene in Industry Sectors (SICs) with 90 Percent of Total Quantity (2003)

Primary SIC Code	SIC Description	Total Priority Chemical Quantity	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
3624	Carbon and graphite products	165,116	4,653	1,478	111,628	0	47,321	37	1,220	2,847
2895	Carbon black	43,745	83	59	36,949	0	6,630	25	0	0
3312	Blast furnaces and steel mills	33,711	0	33,711	0	0	0	0	6,373	0
2865	Cyclic crudes and intermediates	25,785	0	25,204	21	0	330	230	270	0
2911	Petroleum refining	13,102	39	280	8,062	2,403	2,175	144	2,668	532
3334	Primary aluminum	12,900	0	1,958	0	0	10,698	245	19,632	0

Recycling. Exhibit 4.43 provides some indication of the extent to which facilities in certain industry sectors recycled at least 100 pounds of benzo(g,h,i) perylene in 1999-2003, rather than manage it as a waste. For those year(s), the facility did not report a PC quantity, i.e., a quantity managed via land disposal, energy recovery, or treatment.

Exhibit 4.43. Facilities reporting Recycling but not a PC quantity (1999-2003)

			1999		2000		2001		2002		2003	
Number of Facilities	**EPA Region**	**State**	**Onsite Recycle**	**Offsite Recycle**	**Onsite Recycle**	**Offsite Recycle**	**Onsite Recycle**	**Offsite Recycle**	**Onsite Recycle**	**Offsite Recycle**	**Onsite Recycle**	**Offsite Recycle**
SIC 3312-- Blast Furnaces and Steel Mills												
1	2	New York	0	0	567	0	606	0	579	0	559	0
3	3	Pennsylvania	0	0	1,768	0	859	1,273	6,921	904	5,972	6,500
1	4	Alabama	0	0	1,112	0	1,423	0	1,528	0	1,781	0
SIC 3334-- Primary Aluminum												
1	8	Montana	0	0	209	0	17	0	53	0	54	0
SIC 4925-- Gas Production and/or Distribution												
1	5	Indiana	0	0	25,950	0	15,719	0	18,760	0	0	0